LINEAR AND NON-LINEAR THERMAL LENS SIGNAL OF THE FIFTH C-H VIBRATIONAL OVERTONE OF NAPHTHALENE IN LIQUID SOLUTIONS OF HEXANE

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The thermal lens technique is applied to vibrational overtone spectroscopy of solutions of naphthalene in n-hexane. The pump and probe thermal lens technique is found to be very sensitive for detecting samples of low composition (ppm) in transparent solvents. In this experiment two different probe lasers: one at 488 nm and another 568 nm were used. The C-H fifth vibrational overtone spectrum of benzene is detected at room temperature for different concentrations. A plot of normalized integrated intensity as a function of concentration of naphthalene in solution reveals a non-linear behavior at low concentrations when using the 488 nm probe and a linear behavior over the entire range of concentrations when using the 568 nm probe. The non-linearity cannot be explained assuming solvent enhancement at low concentrations. A two color absorption model that includes the simultaneous absorption of the pump and probe lasers could explain the enhanced magnitude and the non-linear behavior of the thermal lens signal. Other possible mechanisms will also be discussed.